NON-PUBLIC?: N
ACCESSION #: 9002230335

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Zion Unit 2 PAGE: 1 OF 4

DOCKET NUMBER: 05000304

TITLE: Manual Reactor Trip Due to EHC Oscillations
EVENT DATE: 01/18/90 LER #: 90-001-00 REPORT DATE: 02/20/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 40

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On January 18, 1989, at approximately 0235, Zion Unit 2 was operating in a steady configuration at approximately 40% power. A condenser tube leak test was being performed. Due to a deficiency in the procedure for this test and subsequent corrective action, a condenser vacuum excursion was experienced. This caused the turbine control system to oscillate governor valves #2 and #3 over a 5% range. The unit operator attempted to alleviate this oscillation condition by switching alternatively between turbine manual and turbine automatic control. Due to continued oscillation of the governor valves, the operator believed that the turbine control system was unable to control the turbine and therefore initiated a manual reactor trip. The governor oscillation was primarily introduced into the turbine control system from the condenser vacuum excursion through the impulse pressure feedback circuit. There were no safety consequences as a result of this event. The test procedure was

rewritten to change the order of the valve line-up preventing future condenser vacuum excursions.

0953D

END OF ABSTRACT

A. CONDITION PRIOR TO EVENT

MODE I - Power - RX Power 40%
RCS AB! Temperature/ Pressure 552 degrees F/2235 psig

There was no equipment out of service prior to this event that contributed to the severity of the event.

B. DESCRIPTION OF EVENT

On January 18, 1989, at approximately 0200, Zion Unit 2 was operating in a steady configuration at approximately 40% power. Procedure TSSP 20-90, "Unit 2 Condenser Tube Leak Helium Test" was being performed. The turbine Electro Hydraulic Control System (EHC) was in automatic with governor valves #2 and #3 operational. Governor valves #1 and #4 were both closed during the entire course of the event. Governor #1 was closed and isolated due to high valve vibration observed at low turbine load, and Governor valve #4 closed due to the low turbine load.

At approximately 0235, a sudden increase in condenser vacuum was experienced. The operators observed governor valve #2 and #3 were in oscillation over approximately a 5% range.

In an attempt to alleviate this oscillation condition, the operator placed EHC into turbine manual. At this point, the EHC system began rapidly opening governor valves #2 and #3. The operator used the governor down button on EHC to stop the increase and attempted to return the governor valve position to approximately the 33% position. During this attempt, some overshoot was encountered and the valves were closed to 22%. Using 'governor up', the operator restored the governor valves to approximately the 33%. condition.

After approximately 30 seconds to 1 minute, the operator determined the system was stable and returned EHC to OPER AUTO (turbine automatic). At this point Governor valves #2 and #3 began cycling open. It was determined that EHC was unable to control the turbine

and therefore initiated a manual reactor trip.

Subsequent to the reactor trip, the following additional observations were made by the unit operator:

1. Permissive P-13 "Turbine Low Power Interlock" was not received until approximately 3 minutes after the initiation of the manual trip.

2. Control rod H-12 did not indicate full insertion after the initiation of the manual trip.

3. Primary coolant pressure decreased to 2070 psig subsequent to the initiation of the manual trip.

C. APPARENT CAUSE OF EVENT

The apparent cause of this event was a deficiency in procedure TSSP 20-90. The procedure was deficient in the order of the valve manipulation of the circulating water inlet valves. The valving procedure defined in TSSP 20-90 resulted in a condition under which condenser vacuum was slowly being lost over a period of approximately one hour.

Upon recovery from this condition, condenser vacuum was fully restored within a period of only several minutes, initiating an oscillation in EHC governor valve response. This oscillation was primarily introduced into the EHC feedback circuit through impulse pressure (MS-24).

C. APPARENT CAUSE OF EVENT (Continued)

In the design of EHC, switching from OPER AUTO (turbine automatic) to TURB MAN (turbine manual) should be a "bumpless" transfer. Normally, the MAN reference signal follows the AUTO load reference signal. However, during short time scale load oscillations, the MAN reference signal may lag behind the AUTO load reference signal. Thus, when switching to MAN from AUTO a sudden change in load could

be experienced.

It is believed that this lag was the primary cause for the sudden change in governor valve position when the operator first switched from AUTO to MAN. The manual control system functioned correctly as

the operator was able to dampen this change in valve position and adjust load in a stable fashion using the governor up and down buttons.

Once in manual, EHC does not respond to the normal feedback signals of impulse pressure, load reference, and speed control. Therefore, stable operation of the governor valves is expected and was observed.

However, once an attempt was made to return to AUTO control, the system would be subjected to the original set of oscillations present in the impulse pressure feedback as the condenser vacuum excursion had not yet terminated. The governor valve oscillations returned, leading the operators to manually trip the unit.

As an aggravating factor, the response of the EHC system was probably magnified by governor valves #1 and #4 being closed. Therefore, for a specific change in power, substantially increased valve motion by valves #2 and #3 is required.

Additionally, post-trip inspection of the EHC system revealed that a portion of the position indication mechanism for governor valve #2 had become detached from the valve actuator arm. This resulted in reducing the position feedback inputs of governor valve #2 into the EHC system. This reduced feedback is not the cause of the EHC oscillation but could have affected its magnitude.

The receipt of Permissive P-13 "Turbine Low Power Interlock" approximately 3 minutes after the initiation of the manual trip was due to the closure of the moisture separator reheater (MSR) intercept valves and the EHC governor valves. This condition effectively isolates the piping from which 2PT-505 and 2PT-506 are tapped. These transmitters feed the P-13 interlock. This isolation condition delayed the response of the transmitter.

The apparent failure of control rod H-12 to indicate full insertion after the initiation of the manual trip is attributed to an alignment problem of the rod position indicator for rod H-12. This was concluded by measuring RPI stack secondary coil voltages for position H-12 verifying full insertion of this control rod.

The reduction of primary coolant pressure to 2070 psig subsequent to the initiation of the manual trip is expected given the pre-conditions of the event and poses no DNB concerns.

D. SAFETY ANALYSIS OF EVENT

There were no safety consequences as a result of this event. All reactor protection and engineered safeguards systems functioned normally and were available during the course of the event.

E. CORRECTIVE ACTIONS

Procedure TSSP 20-90, "Unit 2 Condenser Tube Leak Helium Test" was rewritten to change the order of the valve line-up. The valve line-up restores circulating water before the shell-side off-gas isolation valves are opened to prevent loss of vacuum during execution of this procedure. This procedure was approved on 1/30/90.

System Operating Instruction 33, 'Circ Water and Off Gas' will be revised as necessary to ensure that this valve line-up also restores circulating water before the shell-side off-gas isolation valves are opened. (Commitment #304-200-90-00601)

The rod position indicator for rod H-12 was recalibrated prior to reactor startup.

F. PREVIOUS EVENTS

No significant previous events of this type have occurred at Zion Station.

SOER 84-6, "Reactor Trips Caused by Turbine Control & Protection System Failures" was reviewed, but the recommendations do not apply to this event.

G. COMPONENT FAILURE DATA

None

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Telephone 708/746-2084

February 20, 1990

U. S. Nuclear Regulatory Commission
Document Control Clerk
Washington, D.C. 20555

Dear Sir:

The enclosed Licensee Event Report number 90-001-00, Docket No. 50-304/DPR-48 from Zion Generating Station is being transmitted to you in accordance with the requirements of 10CFR50.73(a)(2)(iv), which requires a 30 day written report when any event or condition occurs that results in manual or automatic actuation of any Engineered Safety Feature.

Very truly yours,

T. P. Joyce
Station Manager
Zion Generating Station

TPJ/Jlc

Enclosure: Licensee Event Report

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